Robert J. McIntosh
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15 May 2019
66-ZB-H200-ASI-19089

Mr. Bill English
Accredited Representative
National Transportation Safety Board
Office of Aviation Safety
490 L'Enfant Plaza East, S.W.
Washington, DC 20594
[redacted]

Subject: Boeing EQA Report - Aero Mexico 737-800 XA-ADV Radome Damage on Approach Tijuana, Mexico, 12 Dec 2018

Dear Mr. English:

In support of the DGAC of Mexico investigation into the subject event, Boeing's Equipment Quality Analysis (EQA) laboratory performed an examination of the damaged Radome Assembly removed from the event airplane. Please find the Equipment Quality Analysis (EQA) report enclosed with this letter.

After completion of the EQA examination, photographs provided by the investigation of the radome interface with the forward fuselage bulkhead of the event aircraft were reviewed. The review showed that an interface seal was installed around the entire periphery of the radome with no openings. This configuration lacked the approximately 8 inch opening in the seal along the bottom of the radome interface specified in engineering drawings and the Airplane Maintenance Manual (AMM 53-52-00) radome installation task. This opening in the seal is required to allow the radome area to drain and for equalization of pressure changes across the radome during flight. A review by our engineering team concluded that the lack of this gap likely resulted in differential pressure across the radome during descent which may have contributed to an internal collapse of the radome.

The information included with this correspondence is controlled under the US Export Administration Regulations (15 CFR Parts 300-799) and has been categorized as ECCN: 9E991.

Please feel free to contact us if you have any questions.

Best regards,

[redacted] for
Robert J. McIntosh
Director, Product Safety

Enclosure: Boeing EQA Report AS12941

Equipment Quality Analysis Report

Boeing Commercial Airplanes

TO: Air Safety Investigations (ASI)

EQA NUMBER: AS12941

DATE: May 2, 2019

MODEL NUMBER: 737-800

AIRPLANE NUMBER: YC485

SUBJECT: ***Radome Damage on Approach***

IDENTIFICATION:

Part name:	Radome Assembly
Boeing part number:	284A1801-4
Serial number:	K0549
Supplier:	Korean Air

REFERENCES:

(a) Boeing Communication System (BCS) message number AMX-AMX-18-1124
(b) Continued Operational Safety Program (COSP) #2018-2223
(c) Boeing Service Letter SL-737-53-106-A

BACKGROUND:

As reported in reference (a), AeroMexico (AMX) reported damage to the radome while on approach to Tijuana (TIJ) on December 12, 2018, at an altitude of 2500 ft.

It was reported that the radome had a large area of damage on the left side, with a separated section of skin folded aft. Photos from the operator showed that the underlying radar antenna was bent, and the base of the antenna was fractured. AMX reported that the radome was repaired May 04, 2017, and was installed May 10, 2017, according to records from the previous operator.

Visibility on the event was elevated due to media speculation of a drone strike, as reported in reference (b).

Aircraft YC485 was delivered on January 26, 2001, and was reported to have accumulated 51,852 hours and 36,158 cycles as of December 31, 2018.

Figure 1 was provided by the operator and is an image of the damaged radome prior to removal.

Figure 1 – Damaged radome prior to removal from the aircraft

SUMMARY:

Visual examinations were performed of the radome exterior and interior. Evidence of prior repairs were noted. No indications of a hard body impact were evident on the radome. No snarge, indicative of a bird strike, was present. DNA samples from the area of interest were collected for follow-on analysis.

EXAMINATION:

The radome, S/N K0549, was examined by Boeing Equipment Quality Analysis (EQA) in the presence of representatives from Boeing Air Safety, Boeing Design Engineering (DE), and the National Transportation Safety Board (NTSB), on February 12, 2019. All investigative steps were taken under the approval of the Directorate General of Civil Aeronautics (DGAC) of Mexico, and the airline AMX, as coordinated by the NTSB.

Overviews of the radome as received by EQA are shown in Figure 2 and Figure 3. The information stamp on the interior of the radome is shown in Figure 4.

Figure 2 – Radome shipping container

Figure 3 – Radome as received

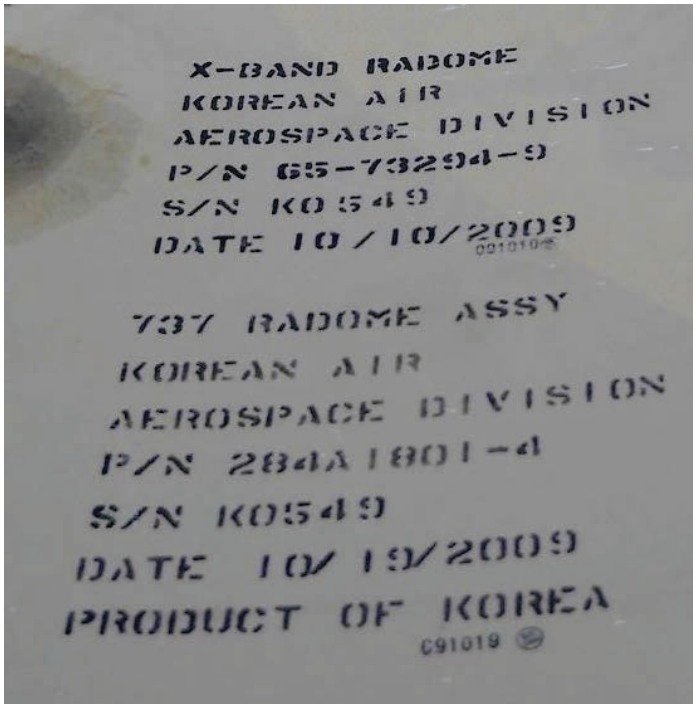

Figure 4 – Information stamp

The radome was removed from the crate and examined. Figure 5 through Figure 7 are overviews of the exterior of the radome, with anomalies detailed. A section of the exterior radome skin had separated from the honeycomb structure, and was attached only in a small area aft of the damage, as seen in Figure 1. As seen in Figure 5, the skin section had been removed and lodged in the crevice of the fractured radome prior to arrival at EQA.

Figure 5 – Overview of damage area

The majority of the damage was on the forward left side of the radome, with isolated fractures in the skin away from the damage area, as seen in Figure 6.

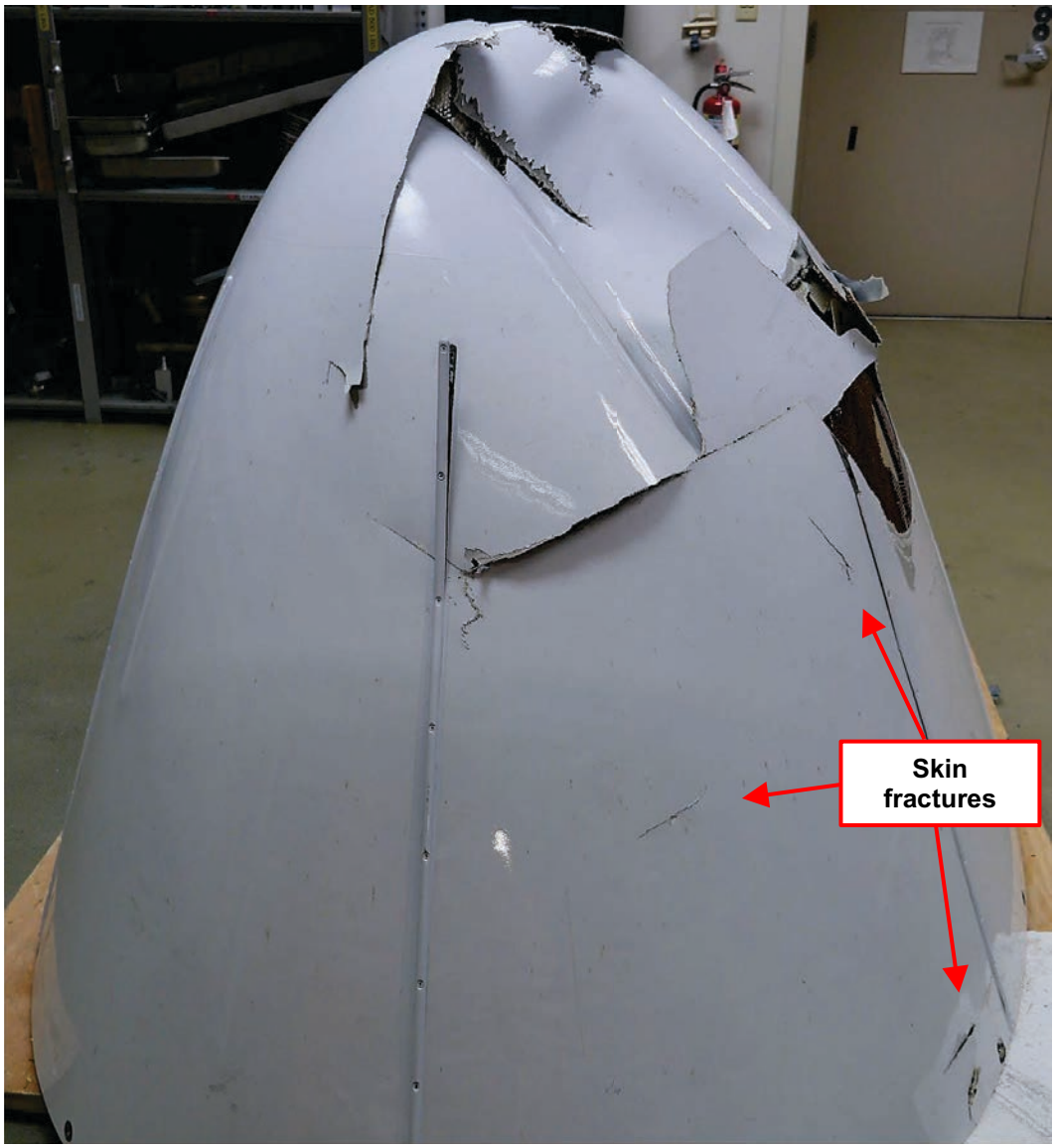

Figure 6 – Radome bottom left view

The areas of greatest interest were at the low point of the indentation and the area where the skin section was removed, as indicated in Figure 7.

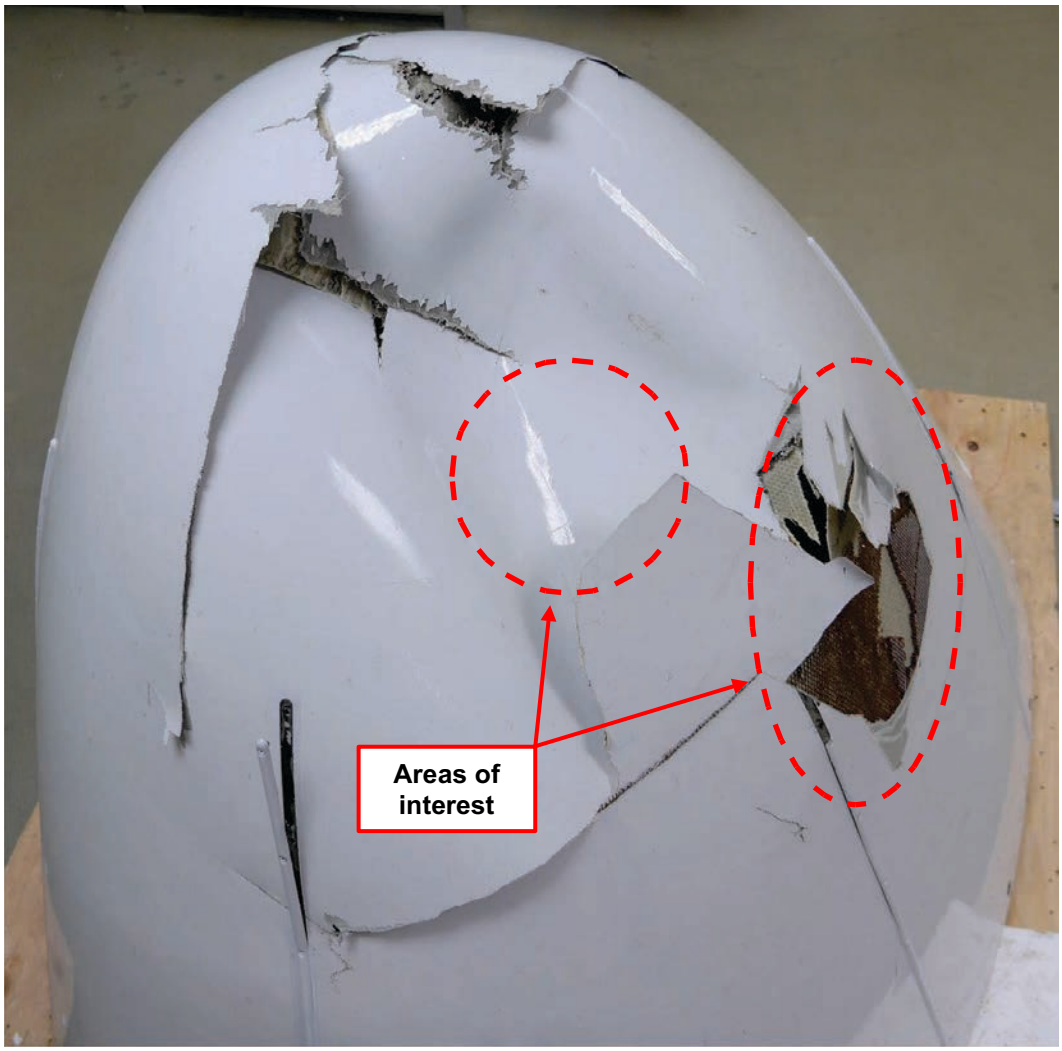

Figure 7 – Radome bottom left view

Figure 8 is a view of the damaged area where the section of skin ply separated from the radome. The visible layers of laminate illustrated in Figure 8, where the skin section was still attached in Figure 1, were noted as delamination between the plies of exterior skin.

Figure 8 – View showing area of separated skin ply section

There were two raised circumferential lines, possibly indicative of layers of paint, visible near the forward area of the radome. An oval surface feature was also visible around the nose of the cone. The red lines in Figure 9 illustrate approximate locations of the raised surface features.

Figure 9 – Radome overview showing where raised surface features were noted

The various surface features are illustrated in Figure 10. Also noted were distinct paint lines adjacent to the lightning diverter straps, which were determined to be most likely indicative of touch-up painting following the application of reference (c) service letter.

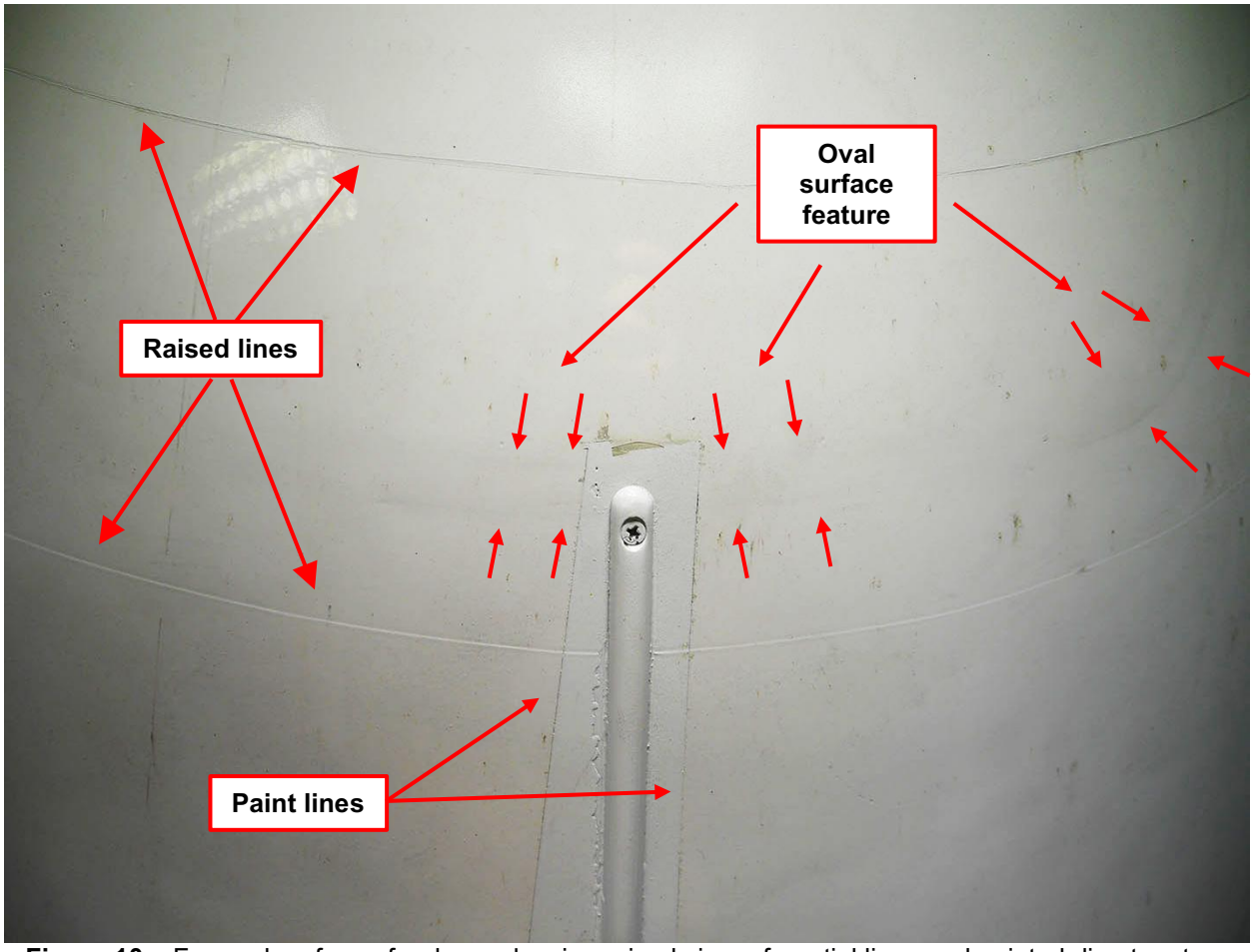

Figure 10 – Forward surface of radome showing raised circumferential lines and painted diverter strap

Inspection of the indentation noted no evidence of an impact. The impact of a hard bodied, or manmade, object was ruled out due to a lack of distinctive marks in the radome surface.

No blood or tissue (snarge) from a bird strike was evident. An alcohol swab was used to collect potential DNA evidence for analysis using the Smithsonian Institution Feather Identification Lab instructions, available from the Federal Aviation Administration. The samples were hand carried by NTSB representatives for shipment to the appropriate laboratory. Figure 11 illustrates the DNA sample area.

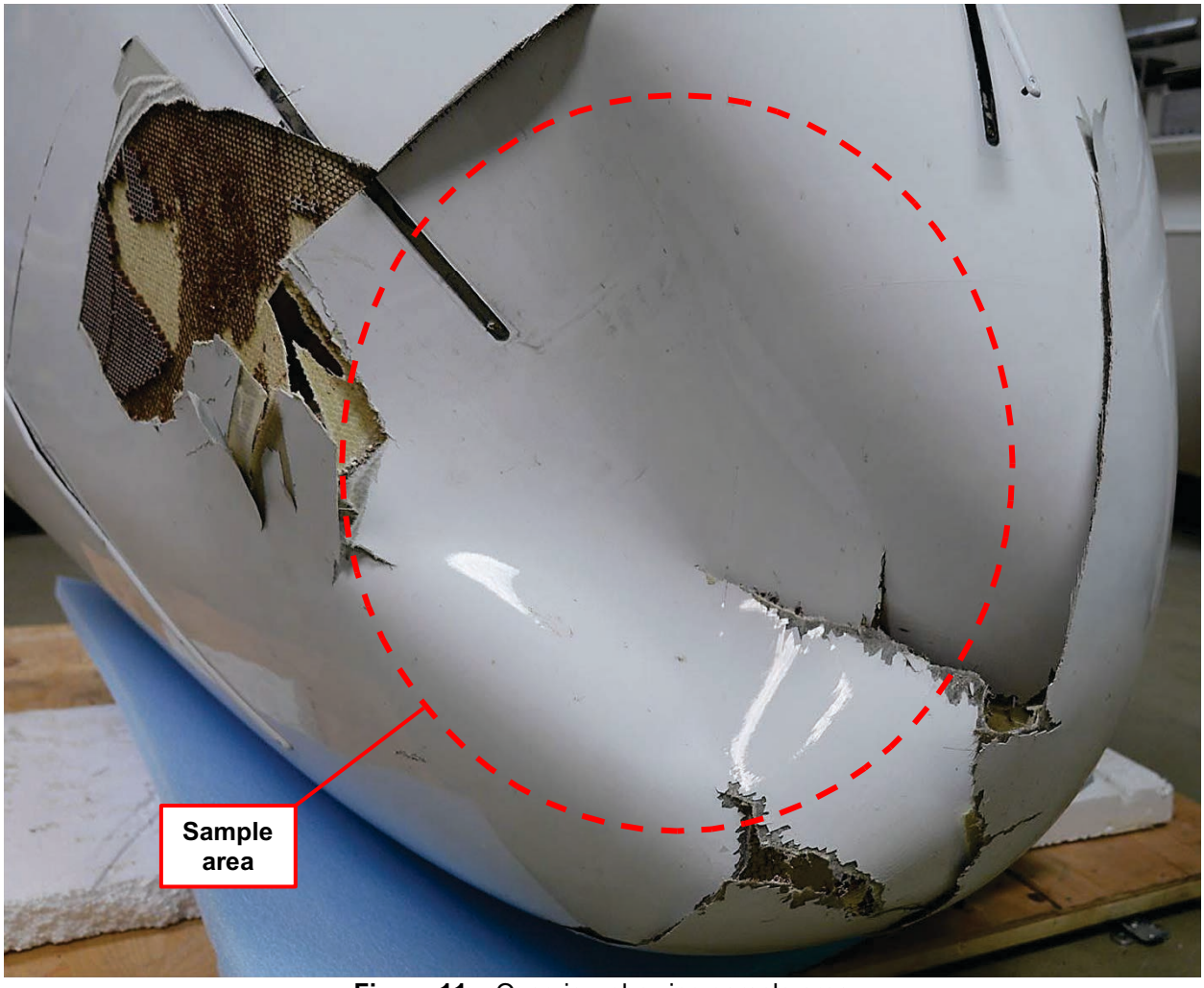

Figure 11 – Overview showing sample area

The radome was placed on the bottom side to inspect the damage to the interior, as shown in Figure 12 and Figure 13.

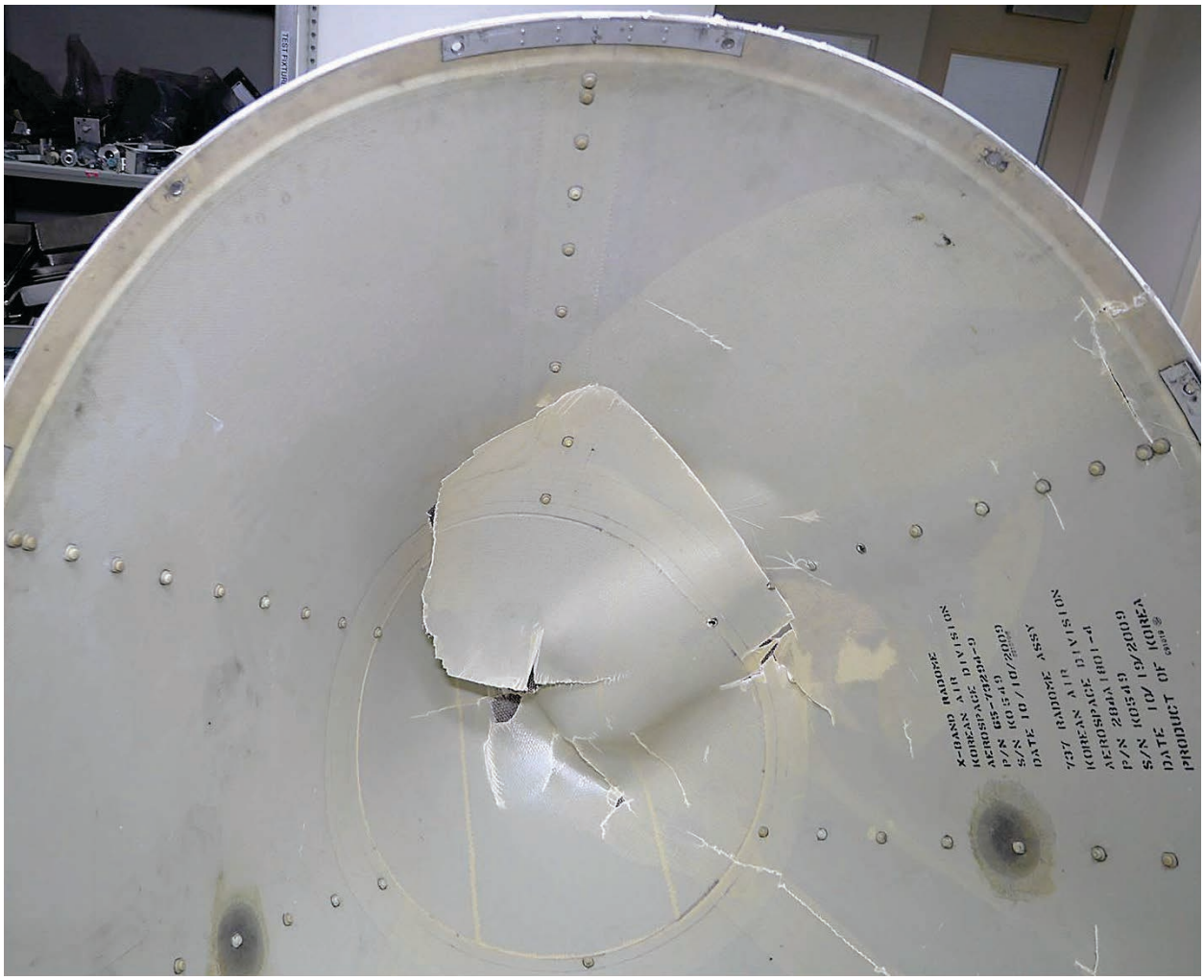

Figure 12 – Radome interior

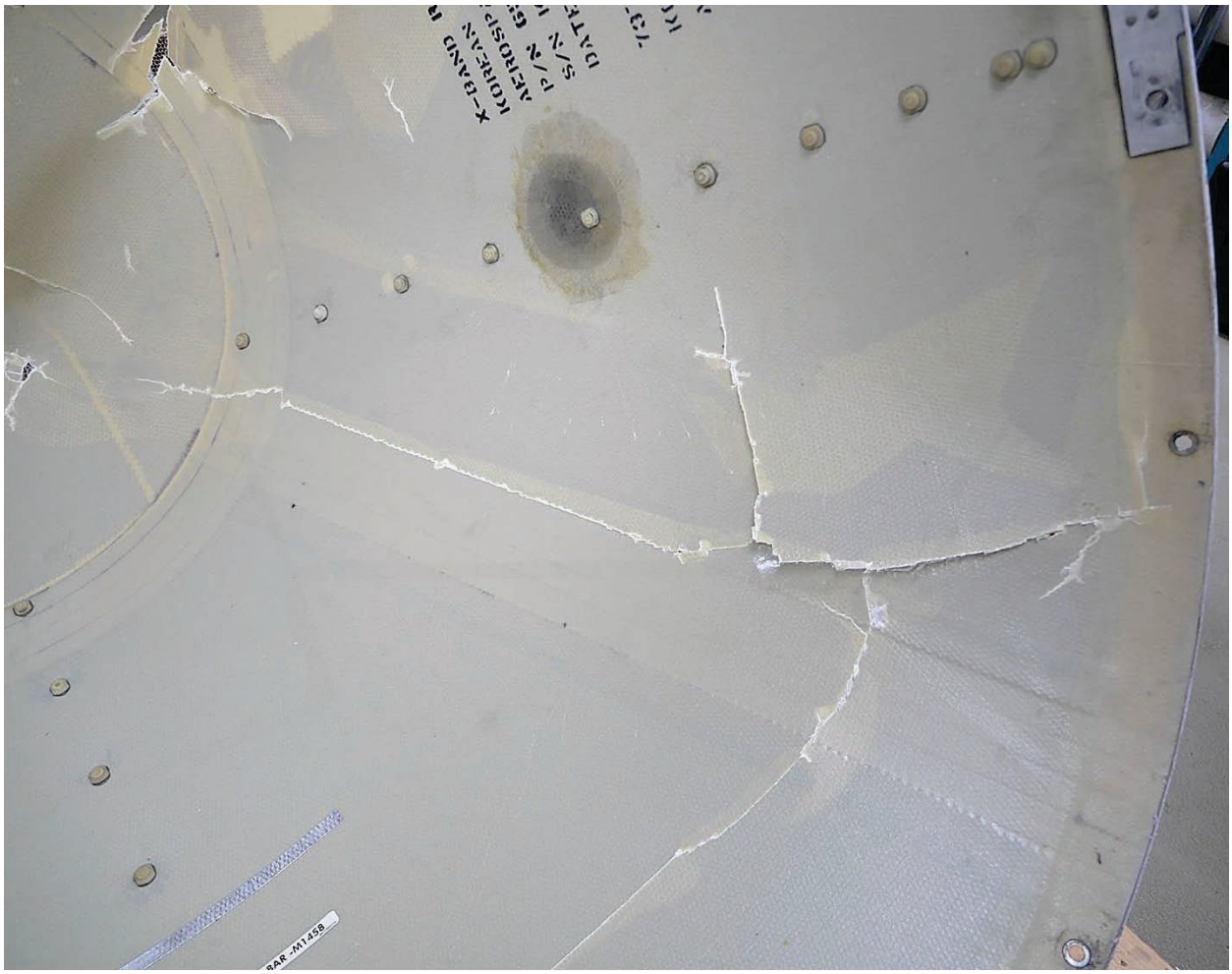

Figure 13 – Radome interior

Dark areas around the diverter strap fasteners, shown in Figure 14, were identified as repairs related to the reference (c) service letter.

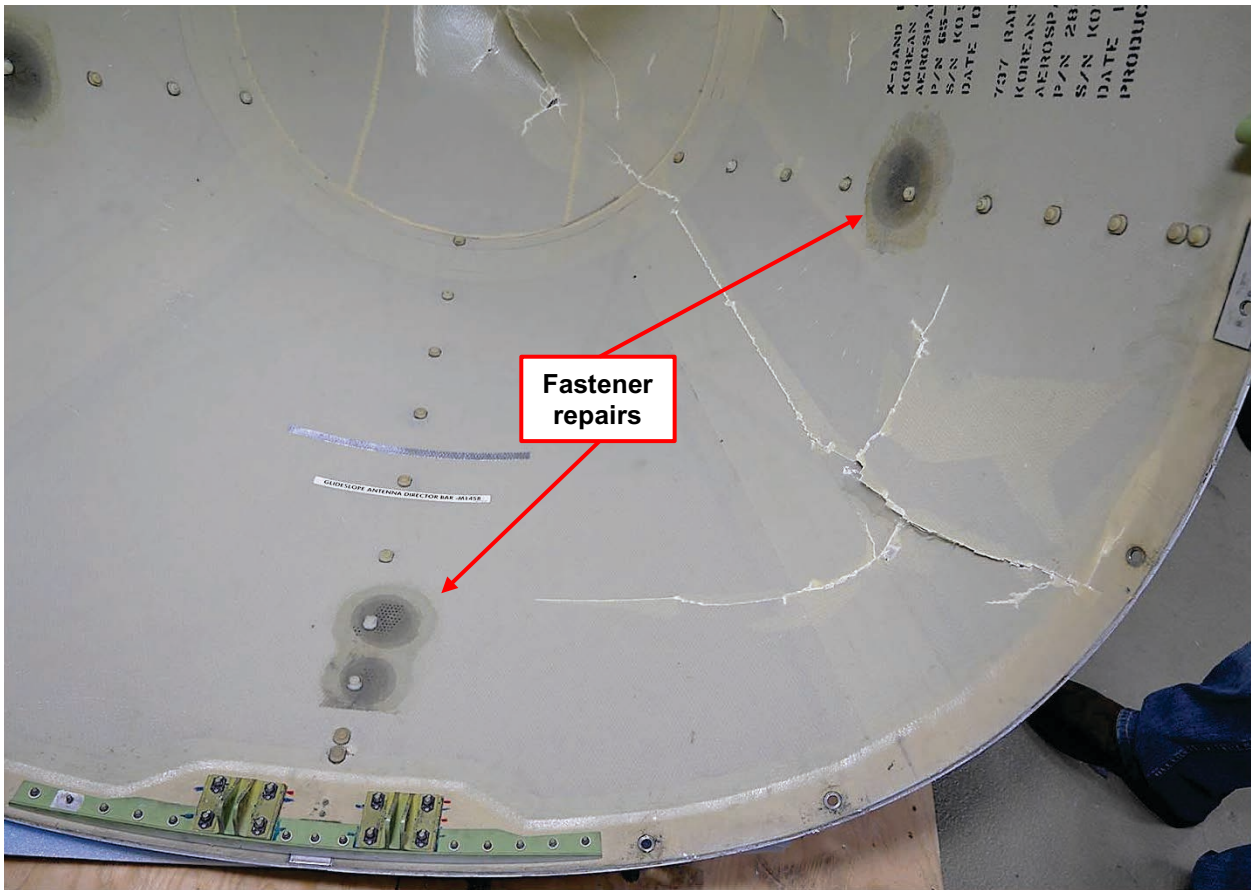

Figure 14 – Radome interior showing fastener repairs

DISPOSITION:

The subject radome was shipped to Preferred Composite Services, Inc. on April 24, 2019, per instructions from the DGAC, at the completion of this analysis.

The preceding information is being submitted to the concerned personnel for action as necessary. The EQA group is contemplating no further action upon this radome (S/N K0549) at this time.